Integrated Design Capability / Instrument Design Laboratory

Ocean Color Experiment Ver. 2 (OCE2)

~ Concept Presentations~

Mechanical Systems

Ed Aguayo

Dave Palace

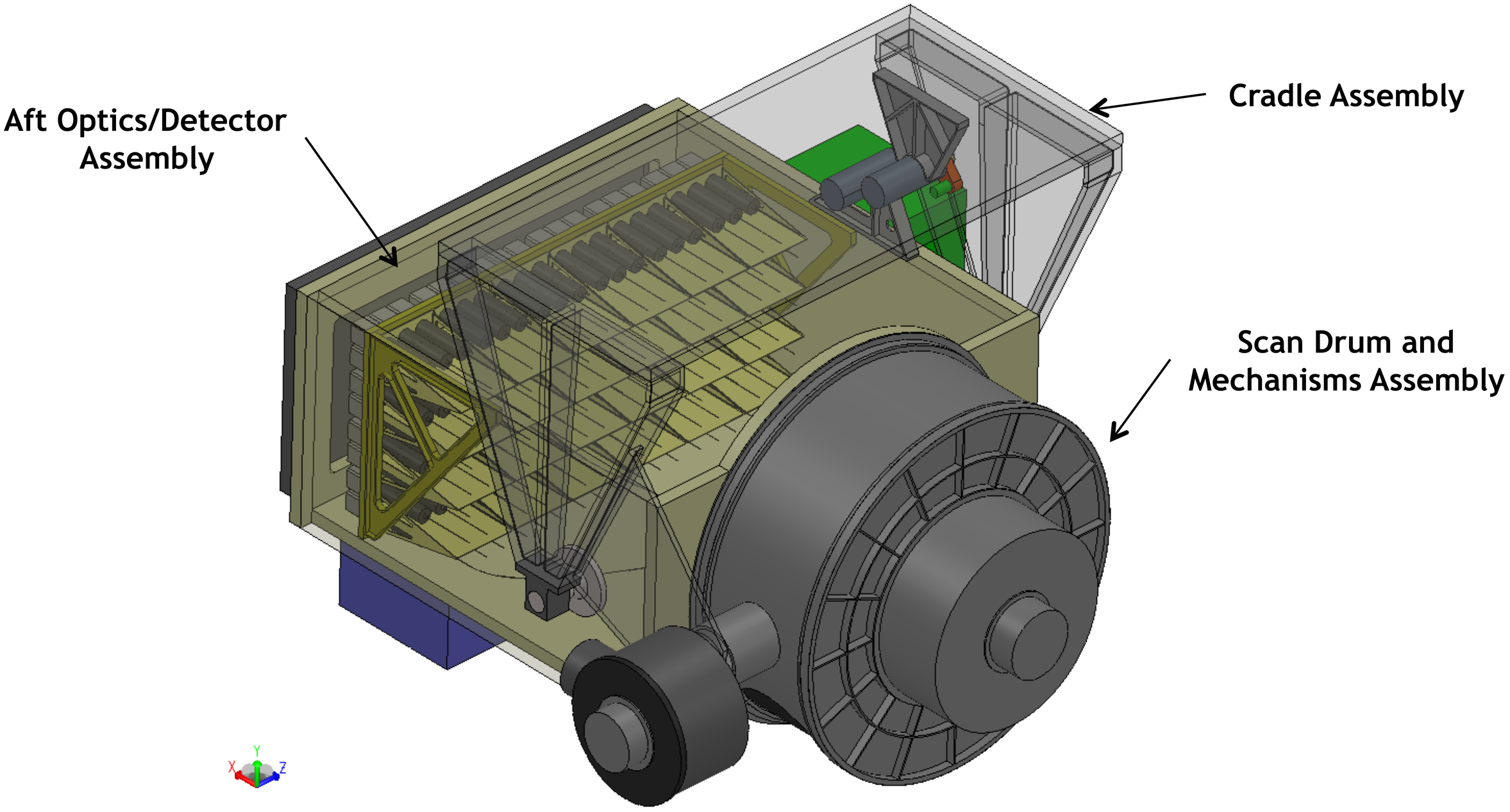
April 27, 2011

Mechanical Systems Work

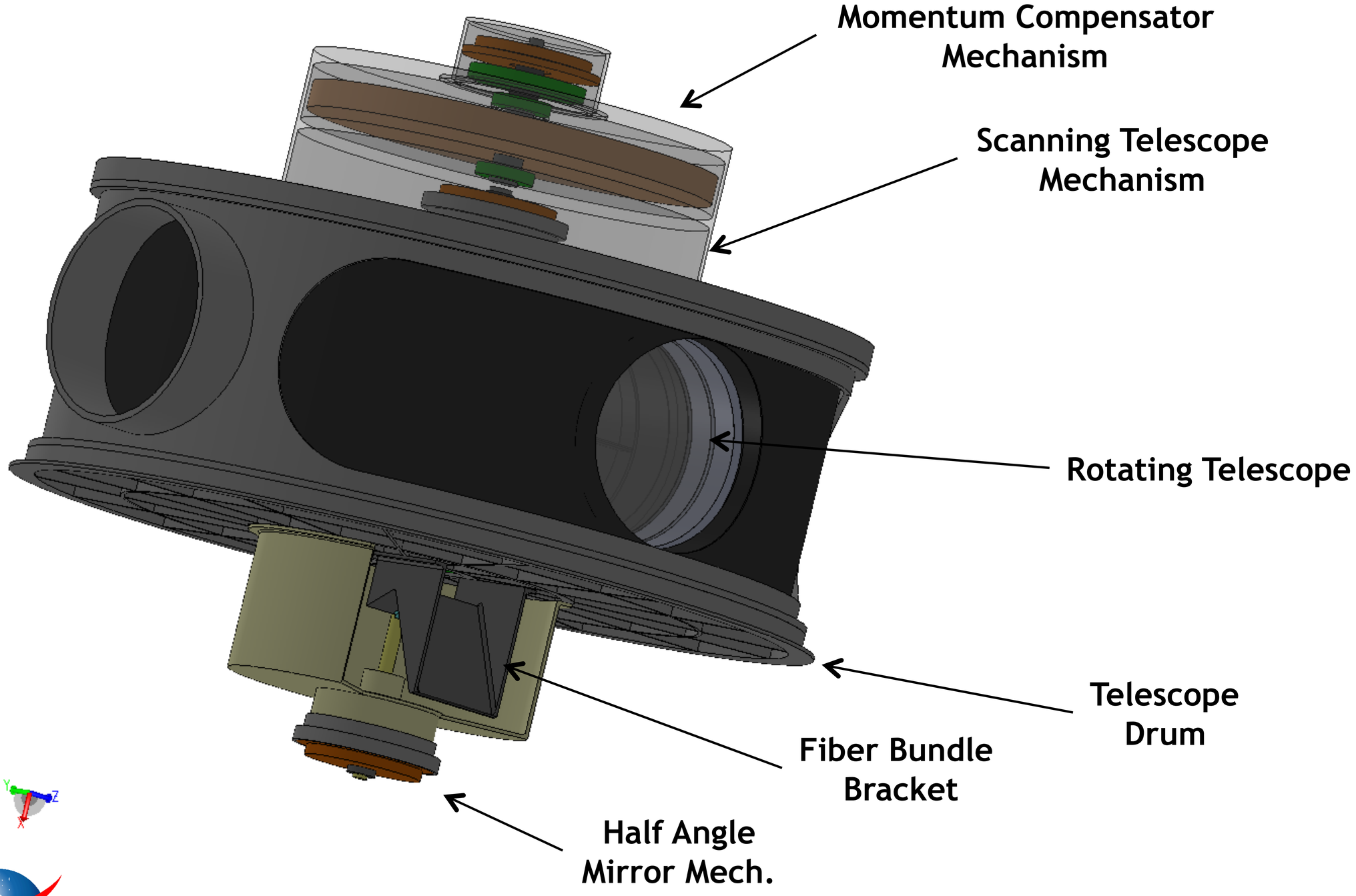
- **Using the design from GOCECP as a baseline template**
- **Three Main Assemblies**
  - Scan Drum And Assembly Mechanism—Telescope, optics, and mechanism that spins the telescope
  - Aft Optics/Detector Assembly—Detectors, Fiber Optics
  - Cradle Assembly—Tilting Mechanism, calibrating mechanism, I/F to Spacecraft
- **Main structural Materials used**
  - Al 6061-T6
  - Aluminum Honeycomb

Instrument Packaging Overview

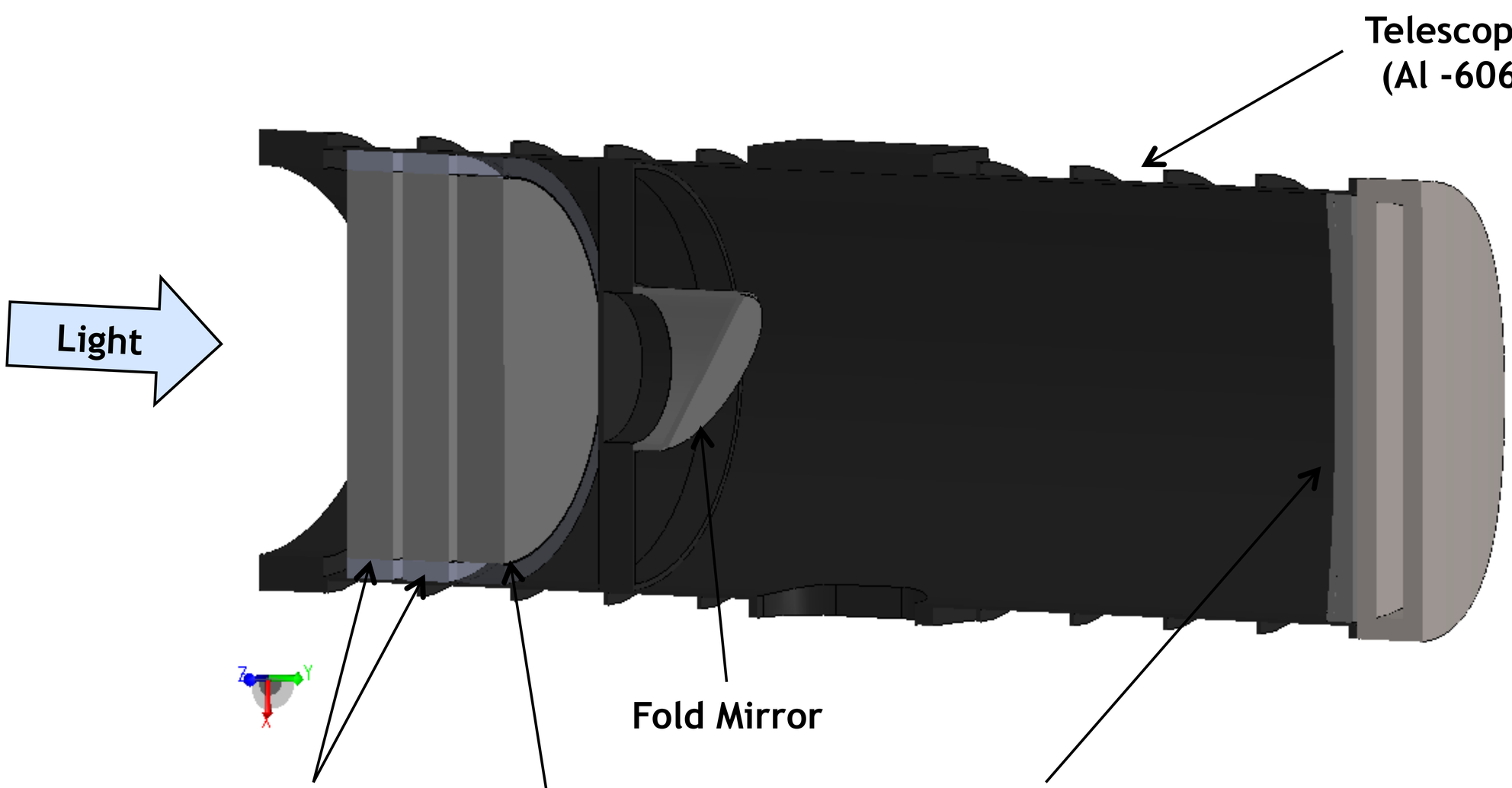
Integrated Design Capability / Instrument Design Laboratory



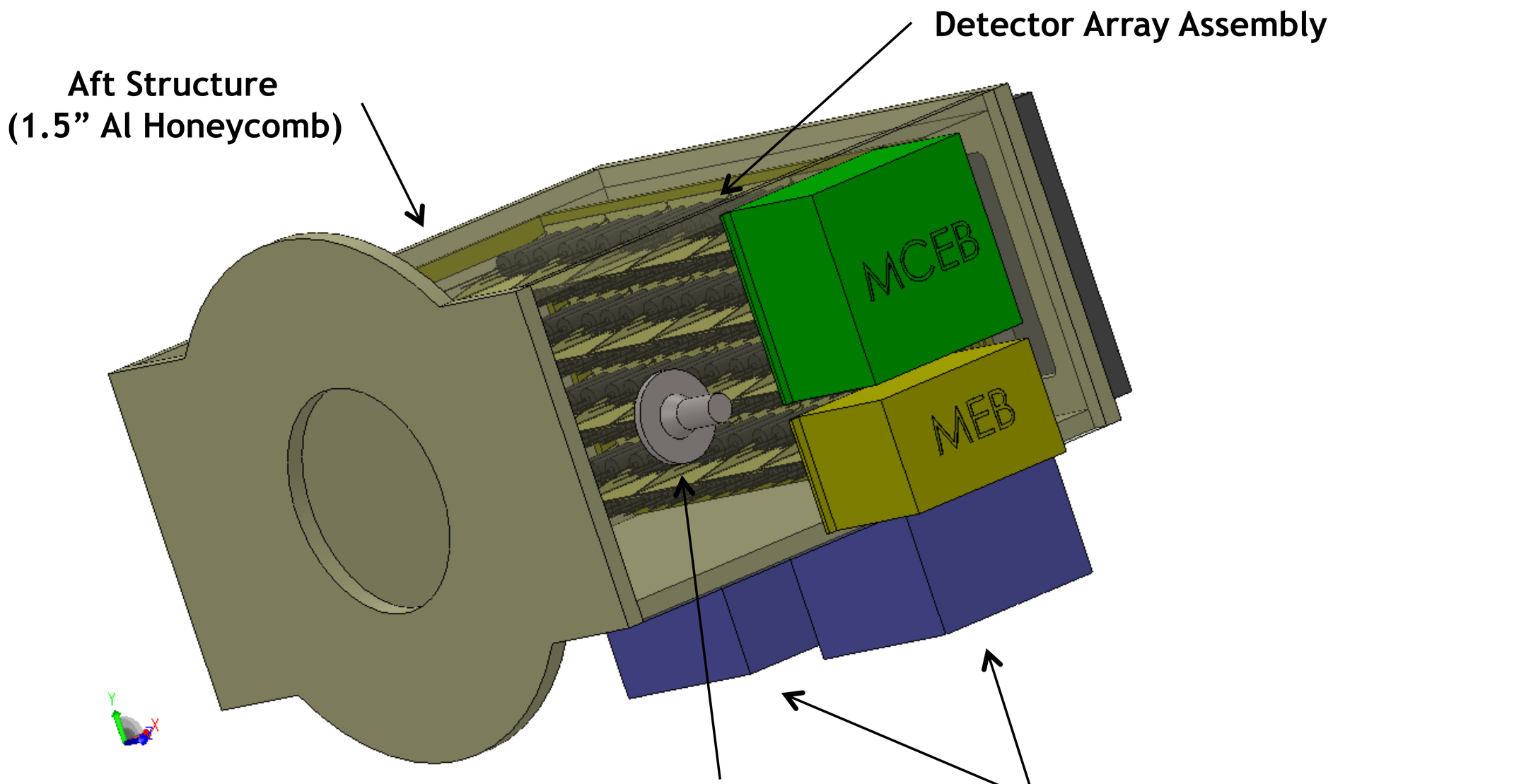
Scan Drum and Mechanism Assembly



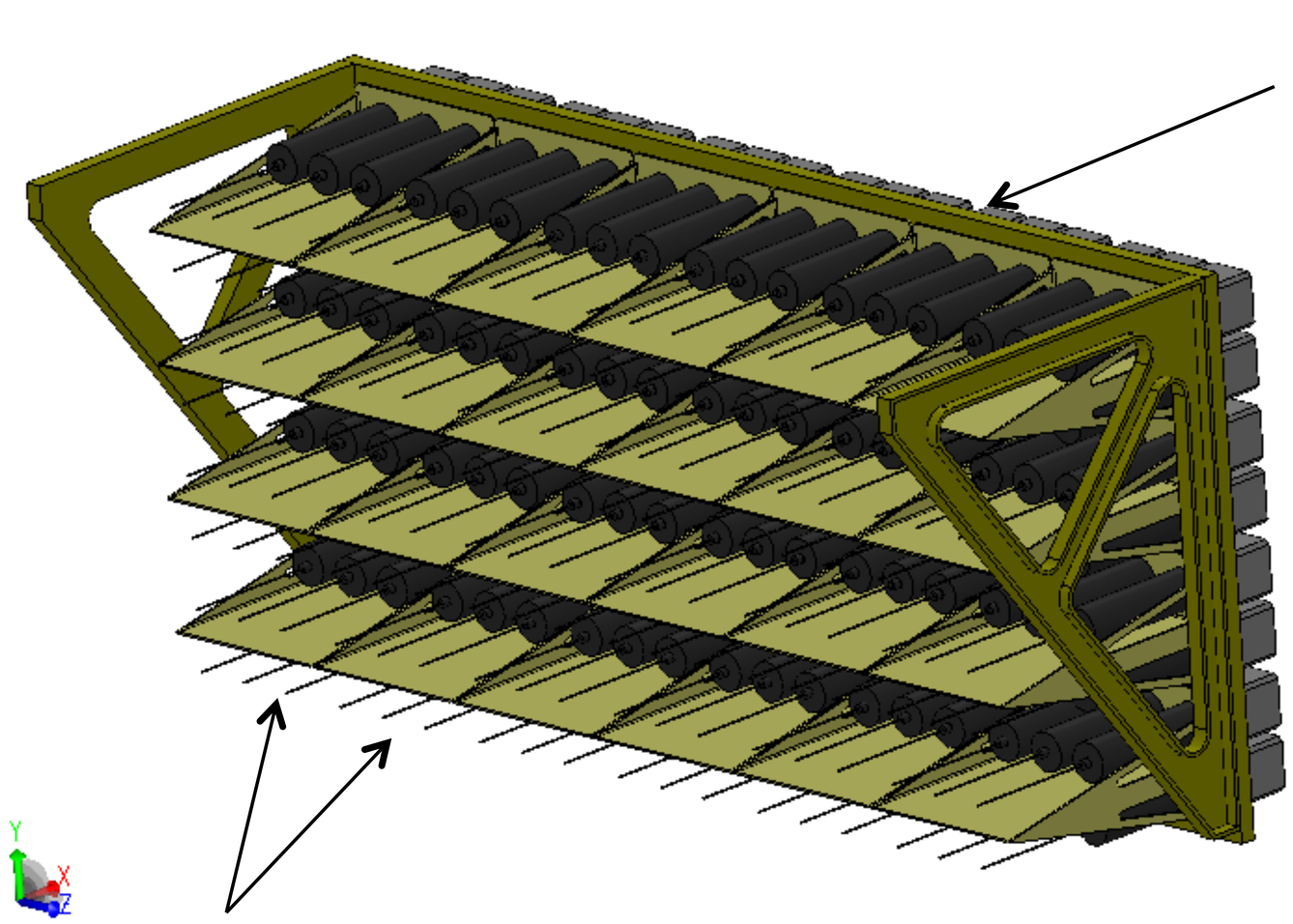
Scanning Telescope Assembly



Aft Optics/Detector Assembly

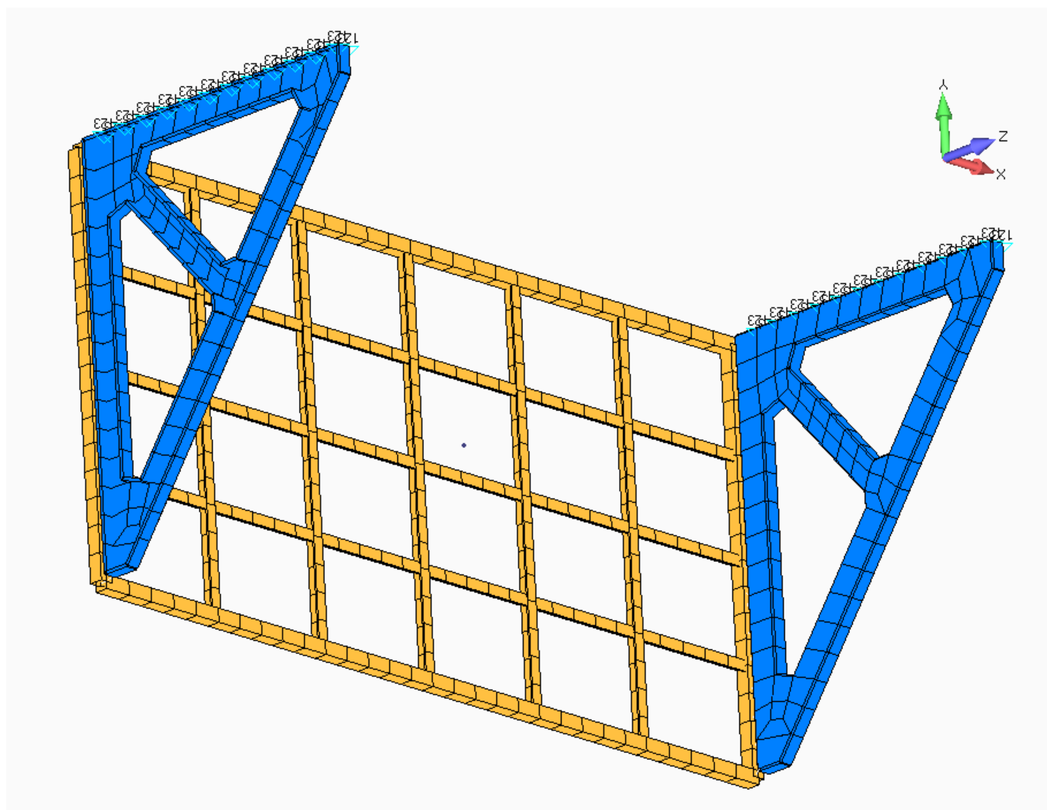


Detector Array Assembly

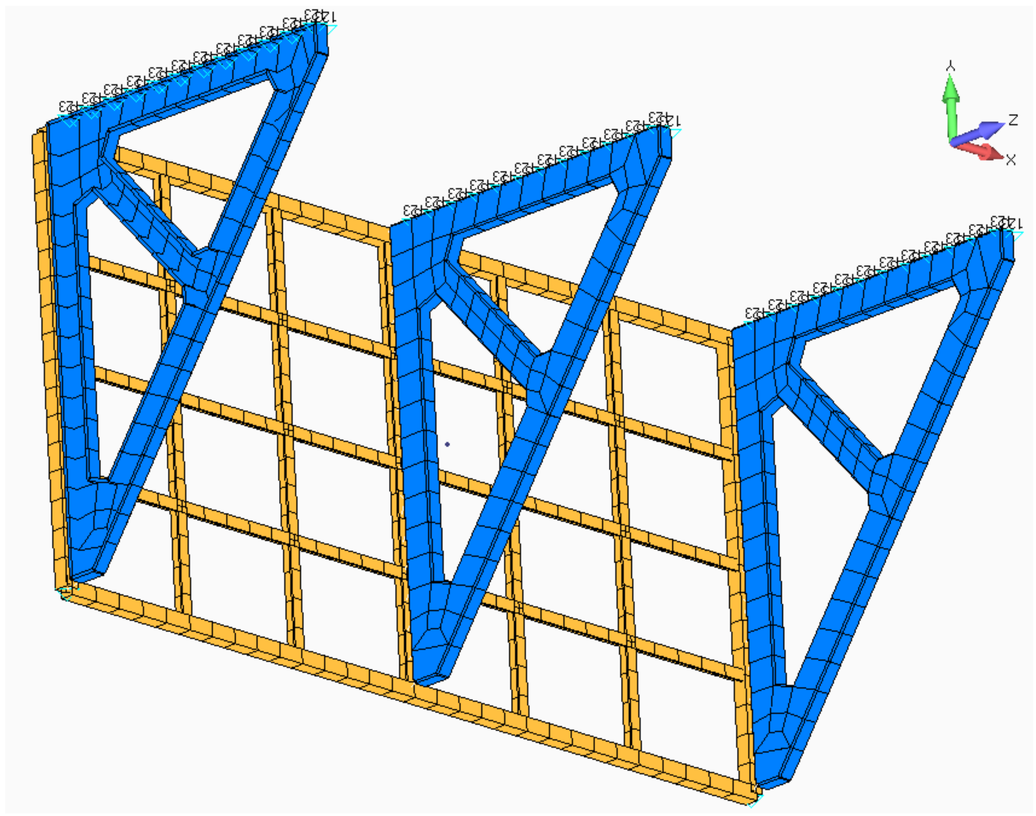


Trade to Add Third Brace

- **Used FEA to compare advantages of 2 vs 3 braces holding the Detector Array Mounting Plate**
  - Simple model using Bar and Plate Elements
  - Mass of Six Pack Assemblies modeled as non-structural mass

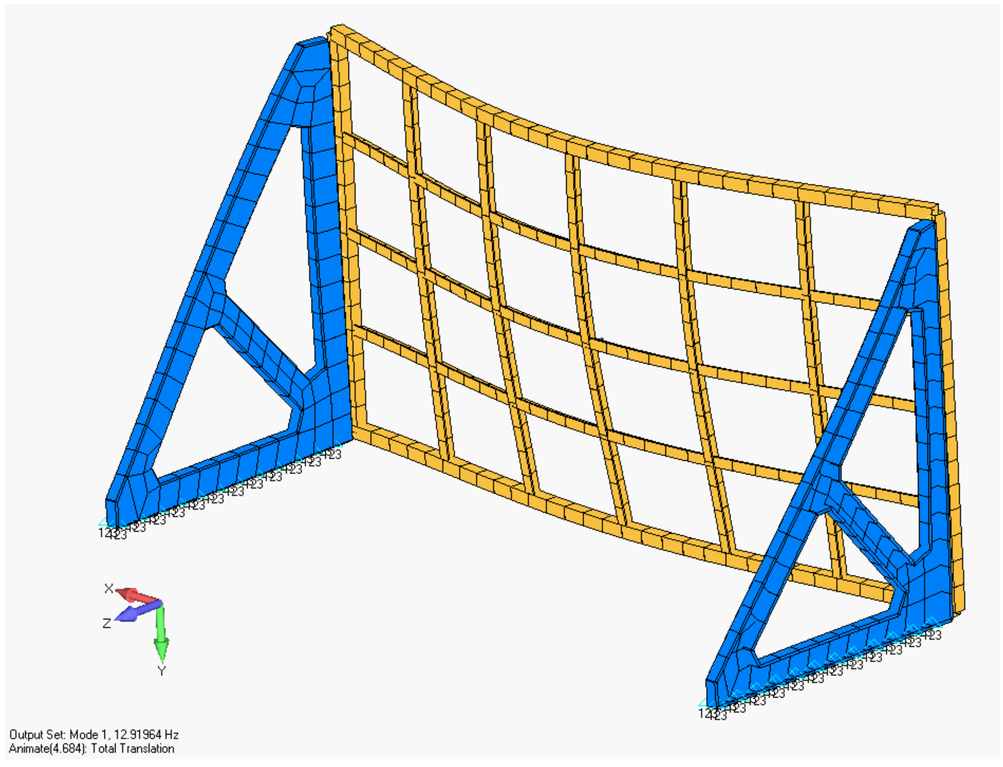


vs

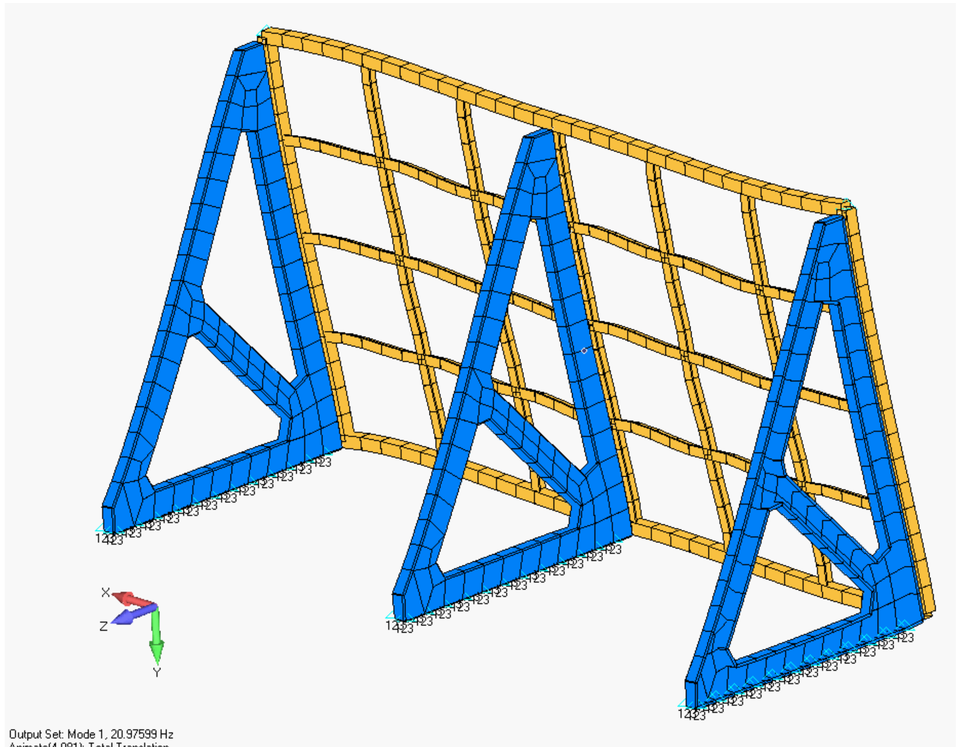


FEA Results

- First mode for two braces 13Hz



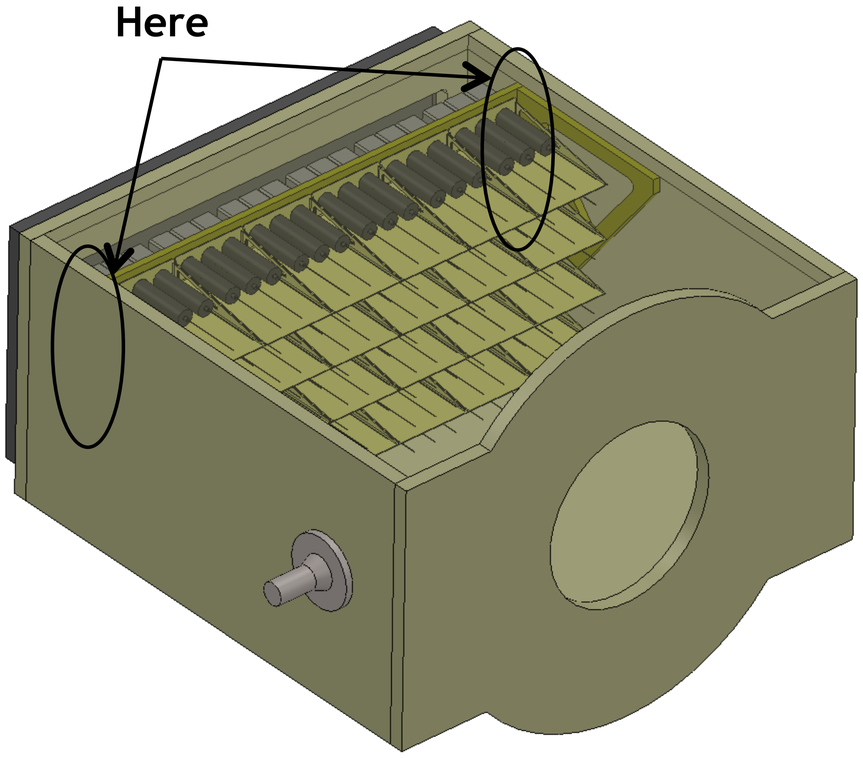
First mode for three braces 21Hz

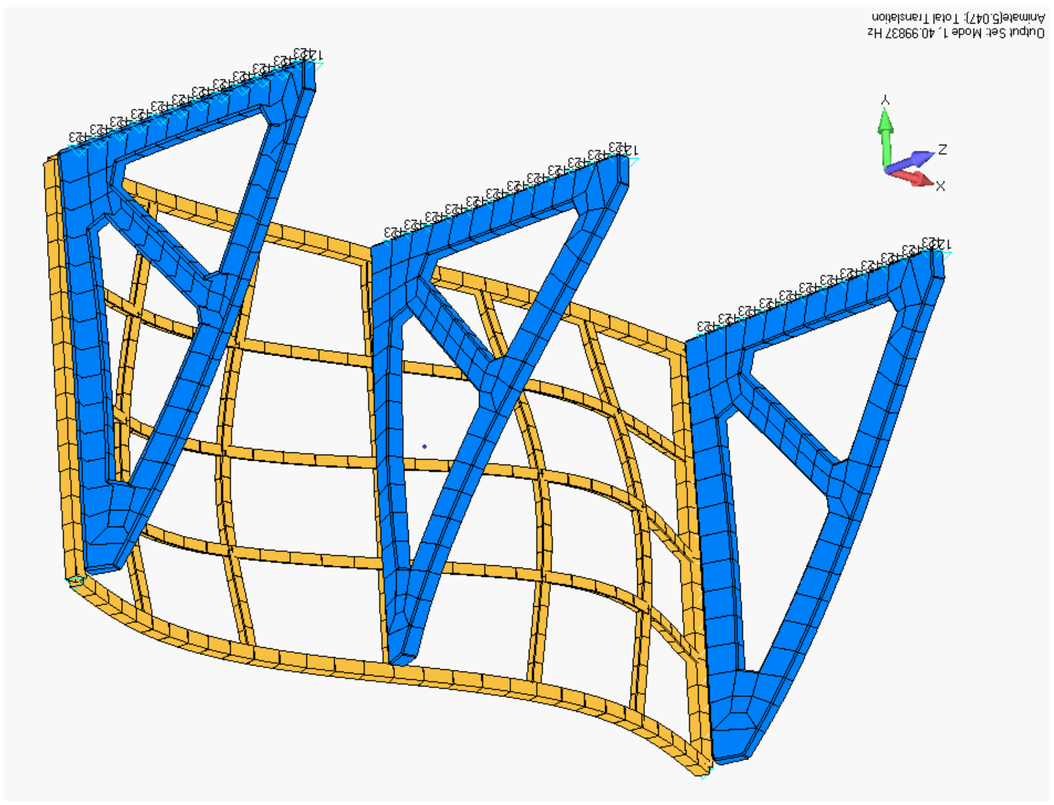


Side Support for Detector Array Structure Assembly

- First mode still low, add support by connecting to Aft Structure Side Panel
  - Increase First Mode to 41Hz which is likely acceptable (need structures blessing)
  - Might need to further increase stiffness

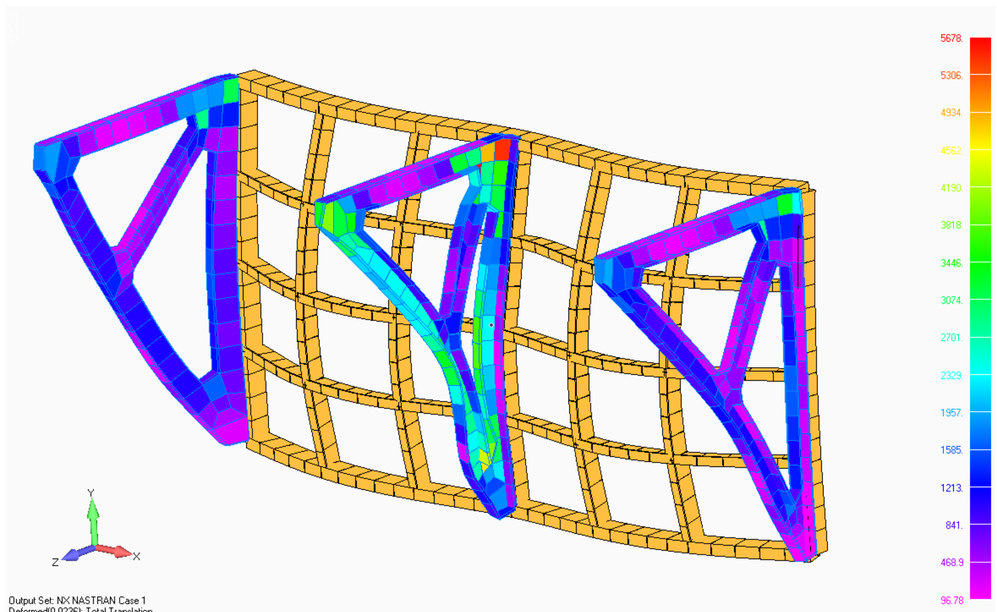
Attach Detector Array Structure Assembly to Aft Structure Side Panel Here

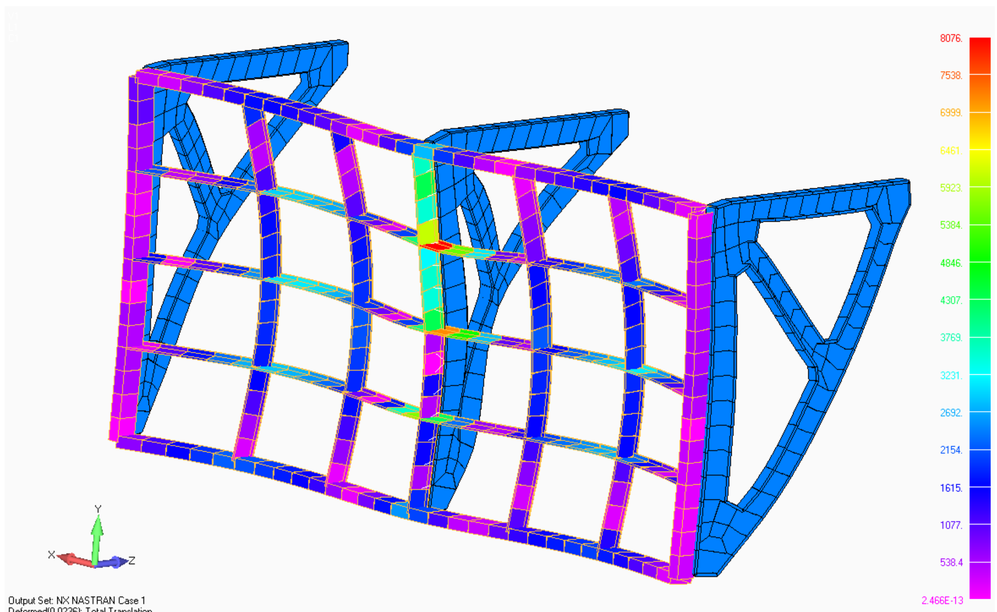




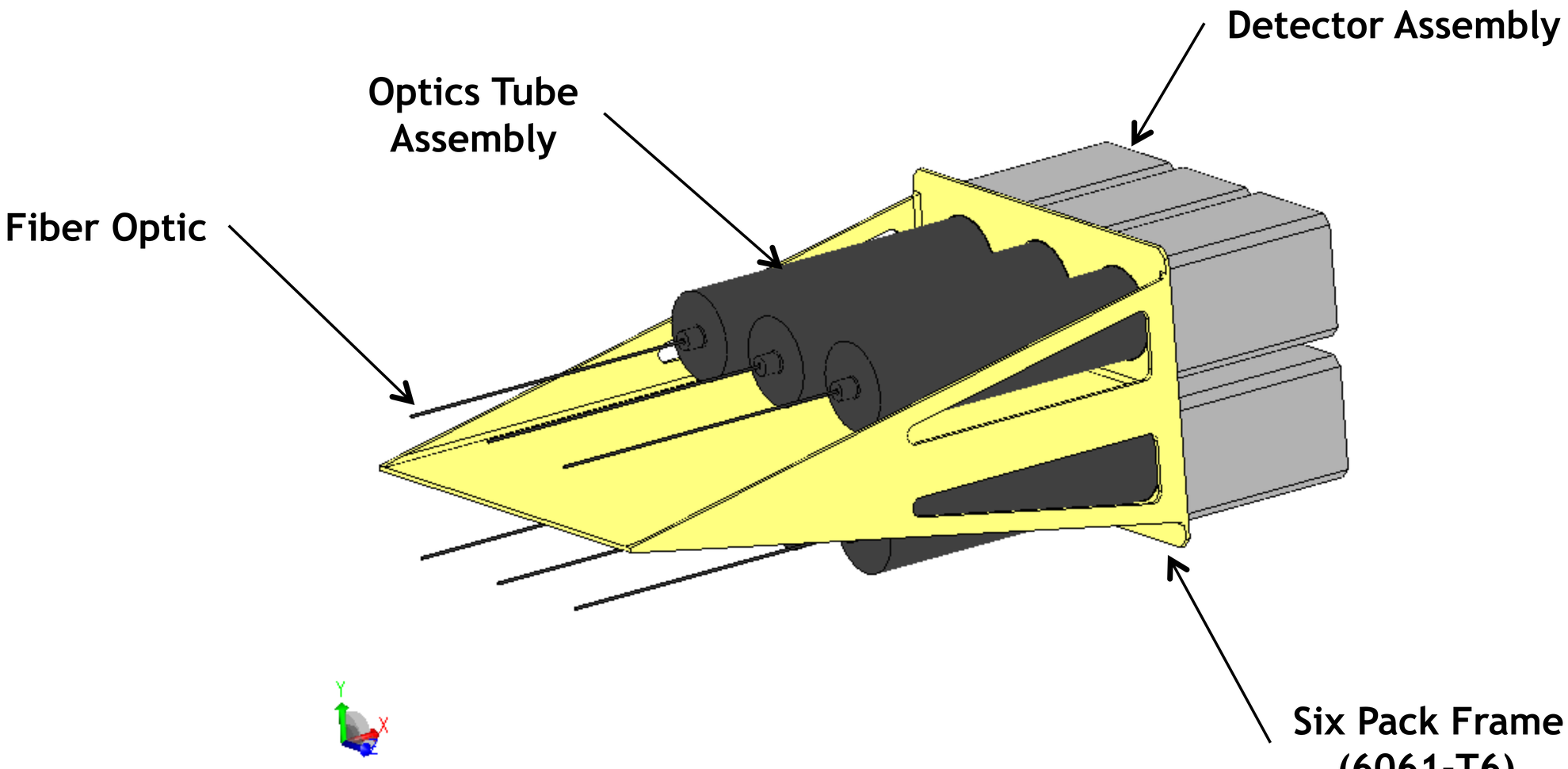
Preliminary FEA of Detector Array Structure Assembly

- Material: Al 6061-T6
- Allowable Assumed (yield): 32ksi
- FS: 1.25
- Max stress: 8.1ksi
- Margin of Safety: (32)/(8.1*1.25)-1 = <u>+2.16</u>





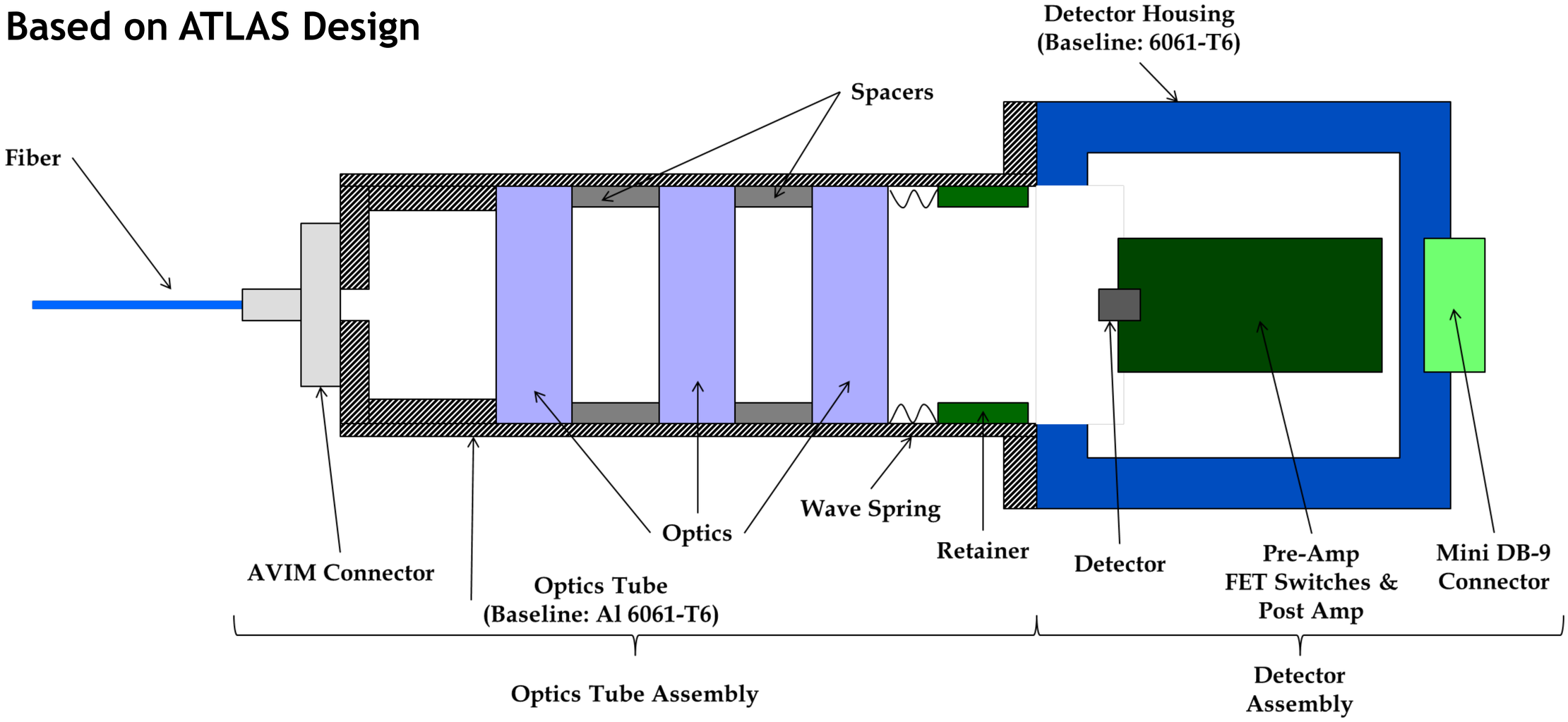
Detector Six Pack

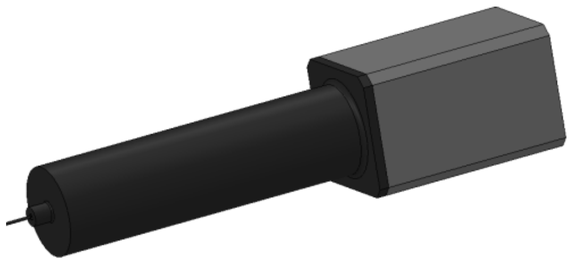


Note: Lens/Detector Assembly = Optics Tube Assembly + Detector Assembly

Lens/Detector Assembly

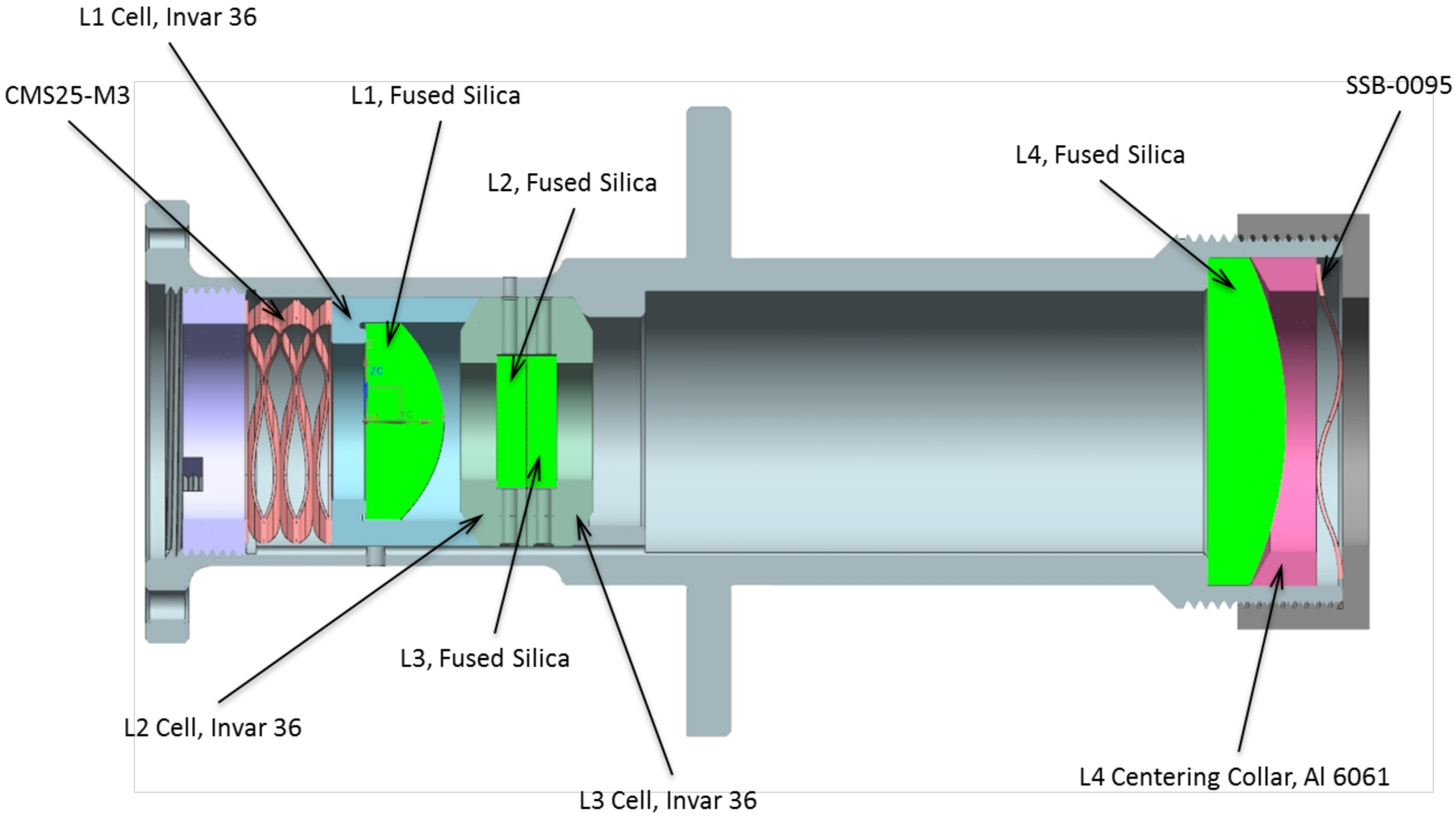
Based on ATLAS Design



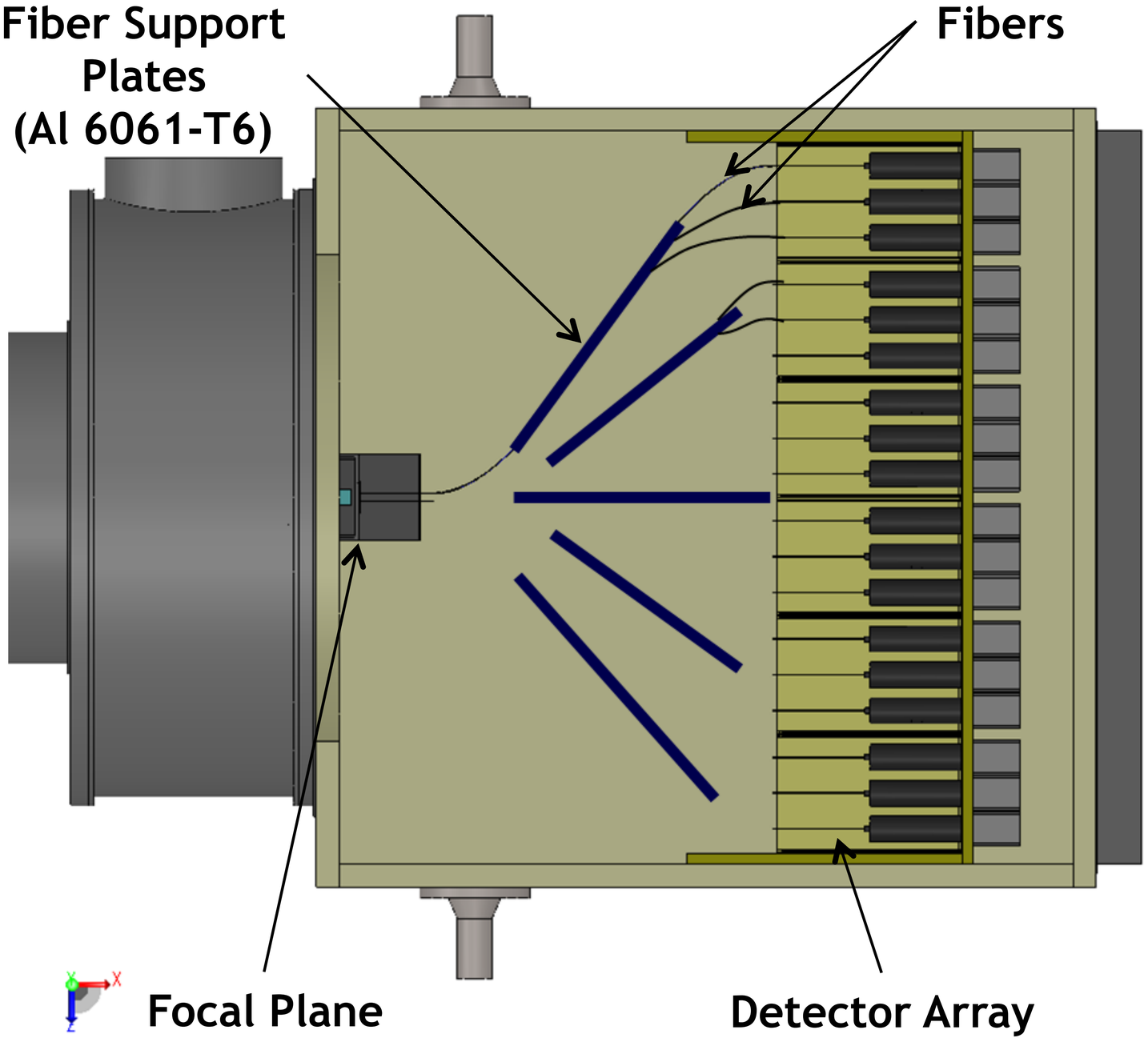


Note: Material to be used for the Optics Tube and Detector Housing is baselined as Aluminum. Depending on temperature excursions of the assembly and optical alignment tolerances, it might be necessary to use Titanium instead.

ATLAS Optics Tube



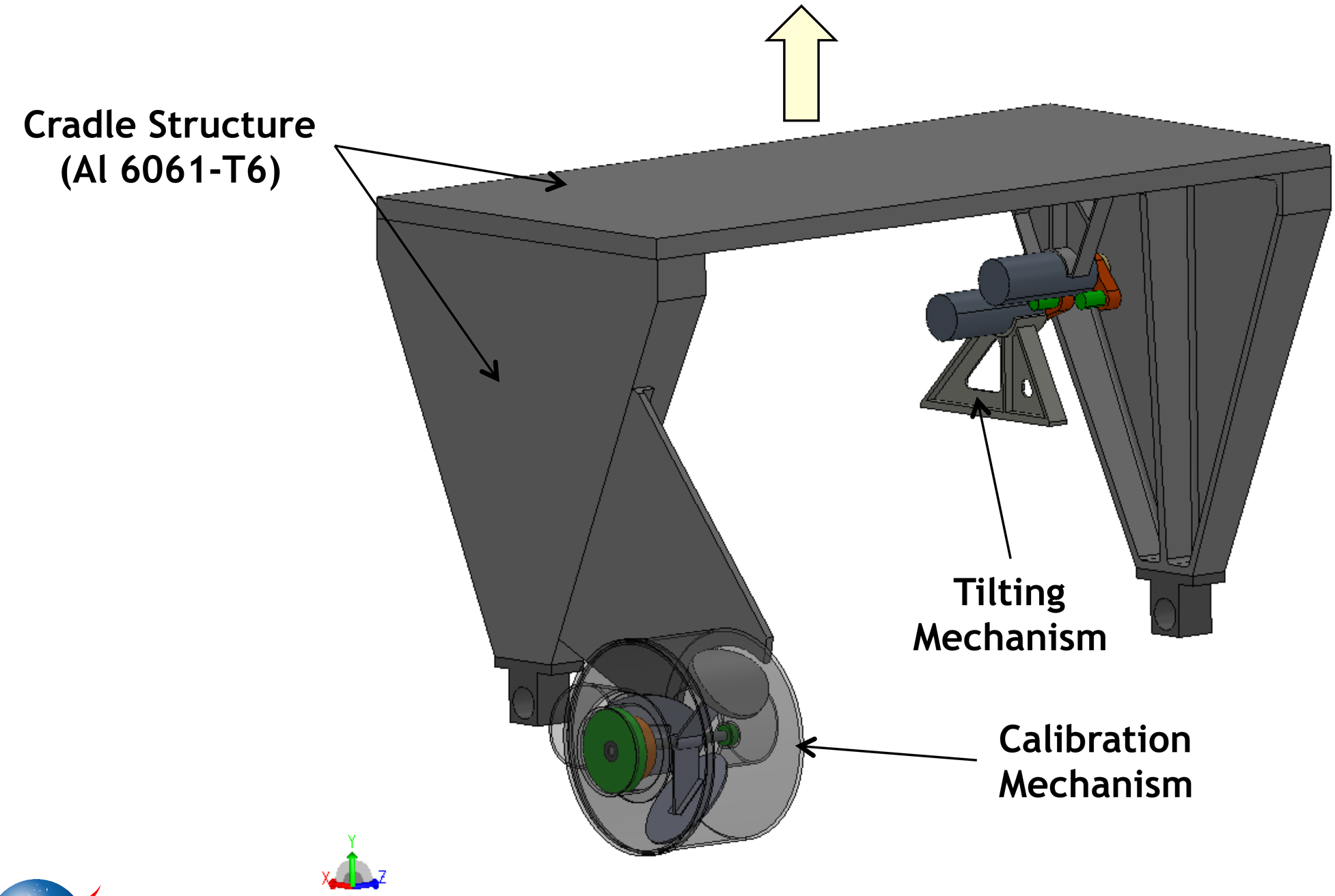
Fiber Optic Routing



Fiber Support Plates have C-channels to route the Fiber optics. It guides them and maintains minimum bend radii

Cradle Assembly

Spacecraft



Concerns

- **Alignment of Optics Tube components and Detector Assembly**
  - Labor intensive for 144 Assemblies if tolerances are tight and alignment needs to be done “by hand” (as opposed to using machine tolerances)
- **Routing of Fiber optics**
  - Difficult Assembly (routing)
  - Nested assembly would make it difficult to disassemble
- **Alignment of fiber bundle to HAM to Telescope**
- **Still Missing Addition of Radiators and Thermal hardware**